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EXAMINER

GUERRERO, MARIA F

ART UNIT PAPER NUMBER

2822

DATE MAILED: 05/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/737,397

Applicant(s)

TSUCHIYA ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-7,9-28 and 30-32 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-7,13-27,33,35,36 and 39 is/are allowed.
- 6) ☒ Claim(s) 1,9-12,28,30-32,34,37,38 and 40 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

1. This Office Action is in response to the Amendment and the Request for continued examination filed February 27, 2003.

Claims 2, 8, and 29 are canceled.

Claims 1, 3-7, 9-28 and 30-32 are pending.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 27, 2003 has been entered.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on February 27, 2003 has been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 28 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Cadien et al. (U.S. 5,516,346) (cited by Applicant).

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Cadien et al. teaches forming a concave in an insulating film formed on a substrate, forming a barrier layer, forming an interconnect metal film (copper or copper alloy) over the whole surface, polishing the surface by a first and second polishing processes until the surface of the insulating film other than the concave is exposed (Fig.4a-4c, col. 10, lines 5-20). Cadien et al. discloses using a polishing slurry comprising silica polishing material and an inorganic salt (fluoride salt) and an oxidizing agent (Abstract, col. 3, lines 1-5, col. 7, lines 1-10, 20-50, col. 8, lines 50-68).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 5, 9-10, 34, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cadien et al. (U.S. 5,516,346).

Cadien et al. teaches forming a concave in an insulating film formed on a substrate, forming a barrier layer, forming an interconnect metal film (copper or copper alloy) over the whole surface, polishing the surface by a first and second polishing processes until the surface of the insulating film other than the concave is exposed (Fig.4a-4c, col. 10, lines 5-20). Cadien et al. discloses using a polishing slurry comprising silica polishing material and an inorganic salt (fluoride salt) and an oxidizing agent (Abstract, col. 3, lines 1-5, col. 7, lines 1-10, 20-50, col. 8, lines 50-68).

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Regarding claims 1, 5, 9-10, 34, and 37, Cadien et al. does not specifically show the polishing-rate ratio as claimed. However, Cadien et al. teaches controlling the etching rate of the barrier layer and the interconnect metal and controlling the etching rate of the interconnect metal and the insulating film (col. 7, lines 50-65, col. 8, lines 17-45, col. 9, lines 1-45).

Regarding claim 1, Cadien et al. does not specifically show the interconnect metal film remained in 5% to 30% inclusive of the surface area other than the concave. However, this step is not considered to be critical because the claim also recites the surface of the insulating film being completely exposed during the polishing process.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Cadien et al. reference by specifying the polishing rate as claimed. The modification would provide a polishing process using non-hazardous and non-corrosive slurries while lowering the cost and avoiding unwanted recessing (col. 9, lines 35-43).

Claims 12 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cadien et al. (U.S. 5,516,346) in view of Applicant admitted prior art.

Regarding claims 12 and 32, Cadien et al. does not specifically show employing a tantalum-containing film as the barrier film. However, Applicant admitted prior art discloses the use of tantalum-containing films as conventional in the art (page 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Cadien et al. reference by specifying the use of

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tantalum as taught applicant admitted prior art because Cadien et al. showed that other materials could be employed (Cadien et al., col. 4, lines 15-25, col. 5, lines 15-21).

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cadien et al. (U.S. 5,516,346) in view of Yasutaka et al. (JP-08083780) (Translation).

Regarding claim 31, Cadien et al. does not specifically show employing benzotriazole as oxidizing agent. However, Yasutaka et al. discloses using a polishing slurry comprising silica polishing material and an inorganic salt, using an oxidizing agent (benzotriazole) (Detailed description pages 2-4, Means page1-2).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Cadien et al. reference by including the use of benzotriazole as taught Yasutaka et al. in order to better control the selectivity.

Claims 11 and 38 rejected under 35 U.S.C. 103(a) as being unpatentable over Cadien et al. (U.S. 5,516,346) as applied to claims 1, 5, 9-10, 34 and 37 above, and further in view of Yasutaka et al. (JP-08083780) (Translation).

Regarding claim 11 and 38, Cadien et al. does not specifically show employing benzotriazole as oxidizing agent. However, Yasutaka et al. discloses using a polishing slurry comprising silica polishing material and an inorganic salt, using an oxidizing agent (benzotriazole) (Detailed description pages 2-4, Means page1-2).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Cadien et al. reference by including the use of benzotriazole as taught Yasutaka et al. in order to better control the selectivity.

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Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cadien et al. (U.S. 5,516,346) as applied to claims 1, 5, 9-10, 34, and 37 above, and further in view of Applicant admitted prior art.

Regarding claim 40, Cadien et al. does not specifically show employing a tantalum-containing film as the barrier film. However, Applicant admitted prior art discloses the use of tantalum-containing films as conventional in the art (page 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Cadien et al. reference by specifying the use of tantalum as taught applicant admitted prior art because Cadien et al. showed that other materials could be employed (Cadien et al., col. 4, lines 15-25, col. 5, lines 15-21, col. 8, lines 12-16).

Response to Arguments

5. Applicant's arguments with respect to claims 1, 9-12, 28, 30-32, 34, 37-38, and 40 have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

6. Claims 3-7, 13-27, 33, 35-36, and 39 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: the cited references, either singly or in combination fail to anticipate or render obvious using the specific polishing slurry as claimed. There is not motivation or suggestion to modify the references in order to meet all claim limitations.


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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-49055. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Maria Guerrero
Patent Examiner
May 16, 2003